Table F2-1
Cost Summary of Groundwater Remedial Alternatives

Alternative	General Response Action	Technology	Capital Costs	Mob/Demob	Engineering	Construction Oversight	Contingency	Post Construction OM&M	Total
GW1	**No Action**	**No Action**	$0	$0	$0	$0	$0	$0	$0
GW2A	**Containment**	**Engineered Surface & Vertical Barriers**							
		Copper Falls Aquifer	$0	$0	$0	$0	$0	$0	$0
		Shallow Groundwater - Filled Ravine	$105,556	$5,278	$15,833	$15,833	$21,111	$0	$163,611
		Shallow Groundwater - Kreher Park (partial cap)	$4,237,768	$211,888	$635,665	$635,665	$847,554	$2,504,757	$9,073,298
		Total	***$4,343,324***	***$217,166***	***$651,499***	***$651,499***	***$868,665***	***$2,504,757***	***$9,236,909***
GW2B	**Containment**	**Engineered Surface & Vertical Barriers**							
		Copper Falls Aquifer	$0	$0	$0	$0	$0	$0	$0
		Shallow Groundwater - Filled Ravine	$105,556	$5,278	$15,833	$15,833	$21,111	$0	$163,611
		Shallow Groundwater - Kreher Park (cap entire Park)	$6,030,852	$301,543	$904,628	$904,628	$1,206,170	$1,469,226	$10,817,047
		Total	***$6,136,408***	***$306,820***	***$920,461***	***$920,461***	***$1,227,282***	***$1,469,226***	***$10,980,658***
GW3	**In-situ Treatment**	**Ozone sparge**							
		Copper Falls Aquifer	$763,000	$38,150	$114,450	$114,450	$152,600	$694,704	$1,877,354
		Shallow Groundwater - Filled Ravine	$133,000	$6,650	$19,950	$19,950	$26,600	$63,550	$269,700
		Shallow Groundwater - Kreher Park	$1,009,000	$50,450	$151,350	$151,350	$201,800	$84,050	$1,648,000
		Total	***$1,905,000***	***$95,250***	***$285,750***	***$285,750***	***$381,000***	***$842,304***	***$3,795,054***
GW4	**In-situ Treatment**	**Surfactant Injection/Dual Phase Recovery**							
		Copper Falls Aquifer	$479,800	$23,990	$71,970	$71,970	$95,960	$682,404	$1,426,094
		Shallow Groundwater - Filled Ravine	$0	$0	$0	$0	$0	$0	$0
		Shallow Groundwater - Kreher Park	$0	$0	$0	$0	$0	$0	$0
		Total	***$479,800***	***$23,990***	***$71,970***	***$71,970***	***$95,960***	***$682,404***	***$1,426,094***
GW5	**In-situ Treatment**	**Permeable Reactive Barrier Well**							
		Copper Falls Aquifer	$0	$0	$0	$0	$0	$0	$0
		Shallow Groundwater - Filled Ravine	$105,556	$5,278	$15,833	$15,833	$21,111	$0	$163,611
		Shallow Groundwater - Kreher Park	$3,650,174	$182,509	$547,526	$547,526	$730,035	$397,088	$6,054,858
		Total	***$3,755,730***	***$187,786***	***$563,359***	***$563,359***	***$751,146***	***$397,088***	***$6,218,469***
GW6	**In-situ Treatment**	**Chemical Oxidation**							
		Copper Falls Aquifer	$2,017,500	$100,875	$302,625	$302,625	$403,500	$2,596,420	$5,723,545
		Shallow Groundwater - Filled Ravine	$1,333,333	$66,667	$200,000	$200,000	$266,667	$67,363	$2,134,029
		Shallow Groundwater - Kreher Park	$1,352,389	$67,619	$202,858	$202,858	$270,478	$94,308	$2,190,510
		Total	***$4,703,222***	***$235,161***	***$705,483***	***$705,483***	***$940,644***	***$2,758,090***	***$10,048,085***
GW7	**In-situ Treatment**	**Electrical Resistance Heating**							
		Copper Falls Aquifer	$4,439,200	$221,960	$665,880	$665,880	$887,840	$123,000	$7,003,760
		Shallow Groundwater - Filled Ravine	$2,852,633	$142,632	$427,895	$427,895	$570,527	$51,250	$4,472,832
		Shallow Groundwater - Kreher Park	$2,949,628	$147,481	$442,444	$442,444	$589,926	$71,750	$4,643,673
		Total	***$10,241,461***	***$512,073***	***$1,536,219***	***$1,536,219***	***$2,048,292***	***$246,000***	***$16,120,265***
GW8	**In-situ Treatment**	**Dynamic Underground Stripping / CROW**							
		Copper Falls Aquifer (DUS)	$4,637,200	$231,860	$695,580	$695,580	$927,440	$123,000	$7,310,660
		Shallow Groundwater - Filled Ravine (CROW)	$1,698,333	$84,917	$254,750	$254,750	$339,667	$51,250	$2,683,667
		Shallow Groundwater - Kreher Park (CROW)	$1,581,111	$79,056	$237,167	$237,167	$316,222	$71,750	$2,522,472
		Total	***$7,916,644***	***$395,832***	***$1,187,497***	***$1,187,497***	***$1,583,329***	***$246,000***	***$12,516,799***
GW9A	**Removal**	**Groundwater Extraction - Existing System**							
		Copper Falls Aquifer	$0	$0	$0	$0	$0	$2,220,466	$2,220,466
		Shallow Groundwater - Filled Ravine	$105,556	$5,278	$15,833	$15,833	$21,111	$0	$163,611
		Shallow Groundwater - Kreher Park	$0	$0	$0	$0	$0	$0	$0
		Total	***$105,556***	***$5,278***	***$15,833***	***$15,833***	***$21,111***	***$2,220,466***	***$2,384,078***
GW9B	**Removal**	**Groundwater Extraction - Enhanced System**							
		Copper Falls Aquifer	$284,500	$14,225	$42,675	$42,675	$56,900	$5,978,656	$6,419,631
		Shallow Groundwater - Filled Ravine	$105,556	$5,278	$15,833	$15,833	$21,111	$0	$163,611
		Shallow Groundwater - Kreher Park	$966,278	$48,314	$144,942	$144,942	$193,256	$17,392,454	$18,890,185
		Total	***$1,356,333***	***$67,817***	***$203,450***	***$203,450***	***$271,267***	***$23,371,111***	***$25,473,427***

Table F2-2
Summary of Wastewater Treatment Volumes for Potential Groundwater Remedial Alternatives

GW-1	No Action	none	none	none	none
GW-2A	Containment - surface (partial cap) & vertical barriers	from infiltration	none	discharge to Park	2,250,000 gal per year
GW-2B	Containment - surface (cap entire Park) & vertical barriers	from infiltration	none	discharge to Park	893,000 gal per year
GW-3	Ozone Sparge	existing system	3 gpm for 5 years	included w/Copper Falls	none
GW-4	Surfactant/Dual Phase Recovery	existing system	3 gpm for 5 years	included w/Copper Falls	none
GW-5	Permeable Reactive Barrier Wall	from infiltration	none	discharge to Park	discharge thru PRB
GW-6	In-situ Chemical Oxidation	enhanced system	15 gpm for 7 years	none	none
GW-7	Electrical Resistance Heating	enhanced system	20 gpm for 12 months	10 gpm for 12 months	20 gpm for 12 months
GW-8	Steam Injection (DUS and CROW)	enhanced system	20 gpm for 6 months	10 gpm for 6 months	20 gpm for 6 months
GW-9A	Groundwater Extraction - Existing System	existing system	3 gpm for 5 years	included w/Copper Falls	none
GW-9B	Groundwater Extraction - Enhanced System	enhanced system	15 gpm for 30+ years	included w/Copper Falls	50 gpm for 30+ years

Table F2-3
Alternate GW2A: Containment Using Engineered Surface and Vertical Barriers (Partial Cap for Kreher Park)

Containment: **Surface Barriers**

		Total Area:	
1	***Asphalt Pavement -***	16,000 sq ft	NSPW Property South of St. Claire Street
	Includes 6 inches stone, 3 inches binder, 2 inches surface.	22,000 sq ft	NSPW Property North of St. Claire Street
		98,000 sq ft	Marina Parking Lot Area
2	***Low Permeability Cap -***		
	Includes 3 feet of clay.	42,500 sq ft	Former Coal Tar Dump Area
		5,000 sq ft	TW-11 Area
		72,000 sq ft	WWTP Area

Upland Area ***Shallow Groundwater - Filled Ravine***

Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
1	Installation of new asphalt pavement	sq. yd.	1,778	$25	$44,444	NSPW Property South of St. Claire Street (includes grading)
2	Installation of new asphalt pavement	sq. yd.	2,444	$25	$61,111	NSPW Property North of St. Claire Street (includes grading)
				Subtotal	**$105,556**	
	Mobilization/Demobilization @	5%	of	$105,556	$5,278	
	Engineering @	15%	of	$105,556	$15,833	
	Construction Oversight @	15%	of	$105,556	$15,833	
				Subtotal	**$142,500**	
	Contingency @	20%	of	$105,556	$21,111	
				Total	**$163,611**	

Kreher Park ***Shallow Groundwater - Kreher Park***
Former Coal Tar Dump and TW-11 Areas

Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
1	Clear and Grub	est.	1	$10,000	$10,000	
2	Installation of new asphalt pavement	sq. yd.	10,889	$25	$272,222	Marina Parking Lot Area
3	Installation of low permeability cap	cy	5,278	$25	$131,944	3 ft. of clay over former coal tar dump area
4	Top Soil	sq. yd.	5,278	$18	$95,000	0.5 ft. topsoil cover over clay cap
5	Vegetation	acre	1.1	$3,500	$3,817	Seeding
6	Storm water Drainage System	est.	1	$30,000	$30,000	For water runoff during storm post-remediation
7	Vertical barrier wall - along shoreline	sf	38,750	$35	$1,356,250	Sheet pile wall (1,550 linear feet and 25 feet deep).
8	Vertical barrier wall - perimeter	sf	32,000	$35	$1,120,000	Sheet pile wall (2,000 linear feet and 16 feet deep).
9	Groundwater Diversion Trench	ln ft	1,525	$50	$76,250	Divert groundwater from upper bluff area around Kreher Park
10	Groundwater Extraction Wells	each	15	$2,500	$37,500	
11	Well Pumps	each	15	$2,500	$37,500	
12	Extraction Well Lateral Piping	ln ft	2,500	$100	$250,000	
13	Discharge Lateral Piping	ln ft	1,500	$75	$112,500	
14	Treatment equipment	each	1	$30,000	$30,000	
15	Building	each	1	$25,000	$25,000	
16	UST/OWS System	Est.	1	$15,000	$15,000	
17	Institutional Control Implementation	est.	1	$5,000	$5,000	Groundwater use and deed restrictions.
	subtotal			**Subtotal**	**$3,607,983**	
	Mobilization/Demobilization @	5%	of	$3,607,983	$180,399	
	Engineering @	15%	of	$3,607,983	$541,197	Includes WPDES permit application.
	Construction Oversight @	15%	of	$3,607,983	$541,197	
				Subtotal	**$4,870,777**	
	Contingency @	20%	of	$3,607,983	$721,597	
				Total	**$5,592,374**	

Table F2-3
Alternate GW2A: Containment Using Engineered Surface and Vertical Barriers (Partial Cap for Kreher Park)

Shallow Groundwater - Kreher Park
WWTP Area

Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
1	WWTP Building Demolition	est.	1	$250,000	$250,000	
2	Installation of low permeability cap	cy	8,000	$25	$200,000	3 ft. of clay at WWTP area (post demolition)
3	Top Soil	sq. yd.	8,000	$18	$144,000	0.5 ft. topsoil cover over clay cap
4	Vegetation	acre	1.7	$3,500	$5,785	Seeding
5	Storm water Drainage System	est.	1	$30,000	$30,000	For water runoff during storm post-remediation
				Subtotal	$629,785	
	Mobilization/Demobilization @	5%	of	$629,785	$31,489	
	Engineering @	15%	of	$629,785	$94,468	
	Construction Oversight @	15%	of	$629,785	$94,468	
				Subtotal	**$850,210**	
	Contingency @	20%	of	$629,785	$125,957	
				Total	**$976,167**	

Post Construction

Item No.	Item	Unit	Quantity	Unit Costs	Total	
1	Annual Inspections	yr	30	$250	$7,500	
2	Post-Closure Reporting/Record Keeping	yr	30	$500	$15,000	
3	Cap Maintenance	yr	30	$1,000	$30,000	
4	Groundwater Extraction System O & M	yr	30	$57,600	$1,728,000	$4,800 per month
5	Groundwater monitoring	yr	30	$25,000	$750,000	shallow groundwater monitoring
6	Annual cap inspection and reporting	yr	30	$5,000	$150,000	
7	Groundwater treatment & disposal	yr	30	$112,500	$3,375,000	2,250,000 gallons per year (from infiltration)
			Subtotal	**$201,850**	**$6,055,500**	
	Present worth @7% Discount				**$2,504,757**	

GRAND TOTAL $9,236,909

Summary	Capital Costs	Mob / Demob	Engineering	Construction Oversight	Contingency	OM & M Costs	Estimated Cost
Installation of surface barrier - upper bluff area	$105,556	$5,278	$15,833	$15,833	$21,111	$0	$163,611
Installation of surface & vertical barrier - Kreher Park	$3,607,983	$180,399	$541,197	$541,197	$721,597	$0	$5,592,374
WWTP Demolition and clay cap	$629,785	$31,489	$94,468	$94,468	$125,957	$0	$976,167
Post construction maintenance and monitoring (30 years)	$0	$0	$0	$0		$2,504,757	$2,504,757
Total Estimated Cost	$4,343,324	$217,166	$651,499	$651,499	$868,665	$2,504,757	$9,236,909

Includes groundwater monitoring costs for shallow groundwater

Table F2-4
Alternate GW2B: Containment Using Engineered Surface and Vertical Barriers (Cap for Kreher Park)

Containment: **Surface Barriers**

		Total Area:	
1	***Asphalt Pavement -***	16,000 sq ft	NSPW Property South of St. Claire Street
	Includes 6 inches stone, 3 inches binder, 2 inches surface.	22,000 sq ft	NSPW Property North of St. Claire Street
		98,000 sq ft	Marina Parking Lot Area
2	***Low Permeability Cap -***		
	Includes 3 feet of clay.	11.5 Acres	Kreher Park

Upland Area ***Shallow Groundwater - Filled Ravine***

Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
1	Installation of new asphalt pavement	sq. yd.	1,778	$25	$44,444	NSPW Property South of St. Claire Street (includes grading)
2	Installation of new asphalt pavement	sq. yd.	2,444	$25	$61,111	NSPW Property North of St. Claire Street (includes grading)
				Subtotal	**$105,556**	
	Mobilization/Demobilization @	5%	of	$105,556	$5,278	
	Engineering @	15%	of	$105,556	$15,833	
	Construction Oversight @	15%	of	$105,556	$15,833	
				Subtotal	**$142,500**	
	Contingency @	20%	of	$105,556	$21,111	
				Total	**$163,611**	

Kreher Park ***Shallow Groundwater - Kreher Park***
Former Coal Tar Dump and TW-11 Areas

Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
1	Clear and Grub	est.	1	$10,000	$10,000	
2	WWTP Building Demolition	est.	1	$250,000	$250,000	
3	Installation of low permeability cap	cy	55,660	$25	$1,391,500	3 ft. of clay over former coal tar dump area
4	Top Soil	sq. yd.	55,660	$18	$1,001,880	0.5 ft. topsoil cover over clay cap
5	Vegetation	acre	11.5	$3,500	$40,250	Seeding
6	Installation of new asphalt pavement	sq. yd.	10,889	$25	$272,222	Marina Parking Lot Area
7	Vertical barrier wall - along shoreline	sf	38,750	$35	$1,356,250	Sheet pile wall (1,550 linear feet and 25 feet deep).
8	Vertical barrier wall - perimeter	sf	32,000	$35	$1,120,000	Sheet pile wall (2,000 linear feet and 16 feet deep).
9	Groundwater Diversion Trench	ln ft	1,525	$50	$76,250	Divert groundwater from upper bluff area around Kreher Park
10	Groundwater Extraction Wells	each	15	$2,500	$37,500	
11	Well Pumps	each	15	$2,500	$37,500	
12	Extraction Well Lateral Piping	ln ft	2,500	$100	$250,000	
13	Discharge Lateral Piping	ln ft	1,500	$75	$112,500	
14	Treatment equipment	each	1	$30,000	$30,000	
15	Building	each	1	$25,000	$25,000	
16	UST/OWS System	Est.	1	$15,000	$15,000	
17	Institutional Control Implementation	est.	1	$5,000	$5,000	Groundwater use and deed restrictions.
	subtotal			**Subtotal**	$6,030,852	
	Mobilization/Demobilization @	5%	of	$6,030,852	$301,543	
	Engineering @	15%	of	$6,030,852	$904,628	Includes WPDES permit application.
	Construction Oversight @	15%	of	$6,030,852	$904,628	
				Subtotal	**$8,141,651**	
	Contingency @	20%	of	$6,030,852	$1,206,170	
				Total	**$9,347,821**	

Table F2-4
Alternate GW2B: Containment Using Engineered Surface and Vertical Barriers (Cap for Kreher Park)

Post Construction

Item No.	Item	Unit	Quantity	Unit Costs	Total	
1	Annual Inspections	yr	30	$250	$7,500	
2	Post-Closure Reporting/Record Keeping	yr	30	$500	$15,000	
3	Cap Maintenance	yr	30	$1,000	$30,000	
4	Groundwater Extraction System O & M	yr	30	$42,000	$1,260,000	$3,500 per month
5	Groundwater monitoring	yr	30	$25,000	$750,000	shallow groundwater monitoring
6	Annual cap inspection and reporting	yr	30	$5,000	$150,000	
7	Groundwater treatment & disposal	yr	30	$44,650	$1,339,500	893,000 gallons per year (from infiltration)
			Subtotal	**$118,400**	**$3,552,000**	
	Present worth @7% Discount				**$1,469,226**	

GRAND TOTAL $10,980,658

Summary

	Capital Costs	Mob / Demob	Engineering	Construction Oversight	Contingency	OM & M Costs	Estimated Cost
Installation of surface barrier - upper bluff area	$105,556	$5,278	$15,833	$15,833	$21,111	$0	$163,611
Installation of surface & vertical barrier - Kreher Park	$6,030,852	$301,543	$904,628	$904,628	$1,206,170	$1,469,226	$10,817,047
Total Estimated Cost	$6,136,408	$306,820	$920,461	$920,461	$1,227,282	$1,469,226	$10,980,658

Includes groundwater monitoring costs for shallow groundwater

Table F2-5
Alternate GW3: Ozone Sparge

In-situ Treatment **Ozone Sparge**

Upland Area ***Copper Falls Aquifer***

Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
	Pilot Test	estimate	1	$25,000	$25,000	
1	Sparge point well installation	each	72	$1,500	$108,000	12 sparge wells per control panel
2	Sparge well line installation	ln ft	10,800	$40	$432,000	150 feet per sparge well
3	Control panel	each	6	$33,000	$198,000	
				Subtotal	**$763,000**	
	Mobilization/Demobilization @	5%	of	$763,000	$38,150	
	Engineering @	15%	of	$763,000	$114,450	
	Construction Oversight @	15%	of	$763,000	$114,450	
				Subtotal	**$1,030,050**	
	Contingency @	20%	of	$763,000	$152,600	
				Total	**$1,182,650**	

Post Construction

Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
1	O & M (ozone sparge)	year	5	$3,000	$15,000	
2	O & M (groundwater treatment)	year	5	$57,600	$288,000	Existing groundwater treatment system
3	Wastewater treatment	year	5	$78,840	$394,200	3 gpm @ $0.05 per gallon
4	Groundwater Monitoring	year	5	$25,000	$125,000	
5	Annual report	year	5	$5,000	$25,000	
			Total	$169,440	$847,200	
	Present worth @7% Discount				**$694,704**	

Shallow Groundwater - Filled Ravine

Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
	Pilot Test	estimate	1	$10,000	$10,000	
1	Sparge point well installation	each	12	$1,500	$18,000	12 sparge wells per control panel
2	Sparge well line installation	ln ft	1,800	$40	$72,000	150 feet per sparge well
3	Control panel	each	1	$33,000	$33,000	
				Subtotal	**$133,000**	
	Mobilization/Demobilization @	5%	of	$133,000	$6,650	
	Engineering @	15%	of	$133,000	$19,950	
	Construction Oversight @	15%	of	$133,000	$19,950	
				Subtotal	**$179,550**	
	Contingency @	20%	of	$133,000	$26,600	
				Total	**$206,150**	

Post Construction

Item No.	Item	Unit	Quantity	Unit Cost	Total
1	O & M (ozone sparge)	year	5	$3,000	$15,000
2	Groundwater Monitoring	year	5	$10,000	$50,000
3	Annual report	year	5	$2,500	$12,500
			Subtotal	**$15,500**	**$77,500**
	Present worth @7% Discount				**$63,550**

Table F2-5
Alternate GW3: Ozone Sparge

Kreher Park

Shallow Groundwater - Kreher Park

Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
	Pilot Test	estimate	1	$25,000	$25,000	
1	Sparge point well installation	each	96	$1,500	$144,000	12 sparge wells per control panel
2	Sparge well line installation	ln ft	14,400	$40	$576,000	150 feet per sparge well
3	Control panel	each	8	$33,000	$264,000	
				Subtotal	$1,009,000	
	Mobilization/Demobilization @	5%	of	$1,009,000	$50,450	
	Engineering @	15%	of	$1,009,000	$151,350	
	Construction Oversight @	15%	of	$1,009,000	$151,350	
				Subtotal	**$1,362,150**	
	Contingency @	20%	of	$1,009,000	$201,800	
				Total	**$1,563,950**	

Post Construction

Item No.	Item	Unit	Quantity	Unit Cost	Total
1	O & M (ozone sparge)	year	5	$3,000	$15,000
2	Groundwater Monitoring	year	5	$15,000	$75,000
3	Annual report	year	5	$2,500	$12,500
			Subtotal	**$20,500**	**$102,500**
	Present worth @7% Discount				**$84,050**

GRAND TOTAL $3,795,054

Summary	Capital Costs	Mob / Demob	Engineering	Construction Oversight	Contingency	OM&M Costs	Estimated Cost
Ozone sparge - upper bluff Copper Falls Aquifer	$763,000	$38,150	$114,450	$114,450	$152,600	$694,704	$1,877,354
Ozone sparge - upper bluff shallow groundwater	$133,000	$6,650	$19,950	$19,950	$26,600	$63,550	$269,700
Ozone sparge - Kreher Park shallow groundwater	$1,009,000	$50,450	$151,350	$151,350	$201,800	$84,050	$1,648,000
Total Estimated Cost	$1,905,000	$95,250	$285,750	$285,750	$381,000	$842,304	$3,795,054

Table F2-6
Alternate GW4: Surfactant Injection and Dual Phase (Vacuum Enhanced) Recovery

In-situ Treatment **Surfactant Injection & Dual Phase Recovery**

Upland Area ***Copper Falls Aquifer***

Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
1	Extraction Wells	each	30	$3,000	$90,000	
2	Surfactant Injection	per gal	45,000	$5	$225,000	300 gallons per well, and 5 applications
3	Vacuum truck	hour	1,000	$100	$100,000	2 to 3 hours per month for one year
4	Wastewater treatment & disposal (vac truck)	year	3	$21,600	$64,800	300 gallons per month per well@$0.2 per gallon
				Subtotal	**$479,800**	
	Mobilization/Demobilization @	5%	of	$479,800	$23,990	
	Engineering @	15%	of	$479,800	$71,970	
	Construction Oversight @	15%	of	$479,800	$71,970	
				Subtotal	**$647,730**	
	Contingency @	20%	of	$479,800	$95,960	
				Total	**$743,690**	

Post Construction

Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
1	Operation and Maintenance	year	5	$57,600	$288,000	Maintain upgraded treatment system
2	Groundwater extraction (existing wells)	year	5	$78,840	$394,200	3 gpm @ $0.05 per gallon
3	Groundwater Monitoring	year	5	$25,000	$125,000	
4	Annual report	year	5	$5,000	$25,000	
			Subtotal	**$166,440**	**$832,200**	
	Present worth @7% Discount				**$682,404**	

GRAND TOTAL $1,426,094

Summary	Capital Costs	Mob / Demob	Oversight & Engineering	Oversight & Engineering	Contingency	OM&M Costs	Estimated Cost
Surfactant injection and dual phase recovery	$479,800	$23,990	$71,970	$71,970	$95,960	$682,404	$1,426,094

Table F2-7
Alternate GW5: Permeable Reactive Barrier Well

In-situ Treatment **Permeable Reactive Barrier Well**

		Total Area:		
1	***Asphalt Pavement -***	16,000	sq ft	NSPW Property South of St. Claire Street
	Includes 6 inches stone, 3 inches binder, 2 inches surface.	22,000	sq ft	NSPW Property North of St. Claire Street
		98,000	sq ft	Marina Parking Lot Area
2	***Low Permeability Cap -***			
	Includes 3 feet of clay.	42,500	sq ft	Former Coal Tar Dump Area
		72,000	sq ft	WWTP Area

Upland Area ***Shallow Groundwater - Filled Ravine***

Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
1	Installation of new asphalt pavement	sq. yd.	1,778	$25	$44,444	NSPW Property South of St. Claire Street (includes grading)
2	Installation of new asphalt pavement	sq. yd.	2,444	$25	$61,111	NSPW Property North of St. Claire Street (includes grading)
				Subtotal	**$105,556**	
	Mobilization/Demobilization @	5%	of	$105,556	$5,278	
	Engineering @	15%	of	$105,556	$15,833	
	Construction Oversight @	15%	of	$105,556	$15,833	
				Subtotal	**$142,500**	
	Contingency @	20%	of	$105,556	$21,111	
				Total	**$163,611**	

Kreher Park ***Shallow Groundwater - Kreher Park***

Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
1	Clear and Grub	est.	1	$10,000	$10,000	
2	WWTP Building Demolition	est.	1	$250,000	$250,000	
3	Vertical barrier wall - along shoreline	sf	38,750	$35	$1,356,250	Sheet pile wall (1,550 linear feet and 25 feet deep).
4	Vertical barrier wall - perimeter	sf	28,000	$35	$980,000	Sheet pile wall (1,750 linear feet and 16 feet deep).
5	Groundwater Diversion Trench	ln ft	1,525	$50	$76,250	Divert groundwater from upper bluff area around Kreher Park
6	PRB Excavation	cy	1,222	$10	$4,889	275 linear feet, 10 feet wide and 12 feet deep
7	Filter Sand	cy	489	$5	$1,630	275 linear feet, 6 feet wide and 8 feet deep
8	GAC cell	cy	326	$100	$32,593	275 linear feet, 4 feet wide and 8 feet deep
9	Top Soil	sq. yd.	4,722	$18	$85,000	0.5 ft. topsoil cover over clay cap
10	Vegetation	acre	1	$3,500	$3,500	Seeding
11	Installation of new asphalt pavement	sq. yd.	10,889	$25	$272,222	Marina Parking Lot Area
12	Installation of low permeability cap	cy	4,722	$25	$118,056	3 ft. of clay over former coal tar dump area
13	Installation of low permeability cap	cy	8,000	$25	$200,000	3 ft. of clay at WWTP area (post demolition)
14	Top Soil	sq. yd.	8,000	$18	$144,000	0.5 ft. topsoil cover over clay cap
15	Vegetation	acre	1.7	$3,500	$5,785	Seeding
16	Storm water Drainage System	Basin	2	$30,000	$105,000	For water runoff during storm post-remediation
17	Institutional Control Implementation	est.	1	$5,000	$5,000	Groundwater use and deed restrictions.
				Subtotal	**$3,650,174**	
	Mobilization/Demobilization @	5%	of	$3,650,174	$182,509	
	Engineering @	15%	of	$3,650,174	$547,526	
	Construction Oversight @	15%	of	$3,650,174	$547,526	
				Subtotal	**$4,927,735**	
	Contingency @	20%	of	$3,650,174	$730,035	
				Total	**$5,657,770**	

Table F2-7
Alternate GW5: Permeable Reactive Barrier Well

Post Construction ***Shallow Groundwater - Kreher Park***

Item No.	Item	Unit	Quantity	Unit Costs	Total	
1	Annual Inspections	yr	30	$500	$15,000	
2	Post-Closure Reporting/Record Keeping	yr	30	$500	$15,000	
3	Cap Maintenance	yr	30	$1,000	$30,000	
5	Groundwater monitoring	yr	30	$25,000	$750,000	shallow groundwater monitoring
6	Annual cap inspection and reporting	yr	30	$5,000	$150,000	
			Subtotal	**$32,000**	**$960,000**	
	Present worth @7% Discount				**$397,088**	

GRAND TOTAL $6,218,469

Summary

	Capital Costs	Mob / Demob	Engineering	Construction Oversight	Contingency	OM & M Costs	Estimated Cost
Installation of surface barrier - upper bluff area	$105,556	$5,278	$15,833	$15,833	$21,111	$0	$163,611
Installation of PRB wall and vertical barrier - Kreher Park	$3,650,174	$182,509	$547,526	$547,526	$730,035	$397,088	$6,054,858
Total Estimated Cost	$3,755,730	$187,786	$563,359	$563,359	$751,146	$397,088	$6,218,469

Includes groundwater monitoring costs for shallow groundwater

Table F2-8
Alternate GW6: In-situ Chemical Oxidation

In-situ Treatment **In-situ Chemical Oxidation**

		Total Area:		
1	***Asphalt Pavement -***	26,000	sq ft	NSPW Property South of St. Claire Street
	Includes 6 inches stone, 3 inches binder, 2 inches surface.	22,000	sq ft	NSPW Property North of St. Claire Street
		98,000	sq ft	Marina Parking Lot Area
2	***Low Permeability Cap -***			
	Includes 3 feet of clay.	42,500	sq ft	Former Coal Tar Dump Area

Upland Area ***Copper Falls Aquifer***

Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
1	Groundwater Extraction Wells	each	7	$5,000	$35,000	Additional extraction wells
2	Pumps	each	7	$2,500	$17,500	
3	Lateral piping	ln ft	1,000	$50	$50,000	
4	UST/OWS System	Est.	1	$15,000	$15,000	Upgrade existing system
5	Wastewater treatment equipment	Est.	1	$25,000	$25,000	Upgrade existing system
6	Drilling	per gal	750,000	$2	$1,500,000	500 holes, 1,500 gallons per hole @ $2 per gallon
7	Reagent Injection	per week	50	$7,500	$375,000	3,000 gallons per day
				Subtotal	**$2,017,500**	
	Mobilization/Demobilization @	5%	of	$2,017,500	$100,875	
	Engineering @	15%	of	$2,017,500	$302,625	
	Construction Oversight @	15%	of	$2,017,500	$302,625	
				Subtotal	**$2,723,625**	
	Contingency @	20%	of	$2,017,500	$403,500	
				Total	**$3,127,125**	

Post Construction ***Copper Falls Aquifer***

Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
1	Operation and Maintenance	year	7	$57,600	$403,200	Existing groundwater extraction system
2	Groundwater extraction (existing wells)	year	7	$394,200	$2,759,400	15 gpm @ $0.05
3	Groundwater Monitoring	year	7	$25,000	$175,000	
4	Annual report	year	7	$5,000	$35,000	
			Subtotal	**$481,800**	**$3,372,600**	
	Present worth @7% Discount				**$2,596,420**	
				Total	**$5,723,545**	

Shallow Groundwater - Filled Ravine

Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
1	Building Demolition	Est.	1	$50,000	$50,000	Center section of NSPW building overlying filled ravine.
2	Vent Well Installation	each	10	$2,500	$25,000	10 passive vent wells
3	Drilling	per gal	450,000	$2	$900,000	300 holes, 1,500 gallons per hole @ $2 per gallon
4	Reagent Injection	per week	30	$7,500	$225,000	3,000 gallons per day
5	Installation of new asphalt pavement	sq. yd.	2,889	$25	$72,222	NSPW Property South of St. Claire Street (includes grading)
6	Installation of new asphalt pavement	sq. yd.	2,444	$25	$61,111	NSPW Property North of St. Claire Street (includes grading)
				Subtotal	**$1,333,333**	
	Mobilization/Demobilization @	5%	of	$1,333,333	$66,667	
	Engineering @	15%	of	$1,333,333	$200,000	
	Construction Oversight @	15%	of	$1,333,333	$200,000	
				Subtotal	**$1,800,000**	
	Contingency @	20%	of	$1,333,333	$266,667	
				Total	**$2,066,667**	

Post Construction ***Shallow Groundwater - Filled Ravine***

Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
1	Groundwater Monitoring	year	7	$10,000	$70,000	
2	Annual report	year	7	$2,500	$17,500	
			Subtotal	**$12,500**	**$87,500**	
	Present worth @7% Discount				**$67,363**	
				Total	**$2,134,029**	

Table F2-8
Alternate GW6: In-situ Chemical Oxidation

Kreher Park ***Shallow Groundwater - Kreher Park***

Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
1	Clear and Grub	est.	1	$10,000	$10,000	
2	Excavation	cy	3,935	$10	$39,352	
3	Bench scale test	est.	1	$5,000	$5,000	
4	Reagent Mixing	cy	3,935	$50	$196,759	
5	Drilling	per gal	225,000	$2	$450,000	150 holes, 1,500 gallons per hole @ $2 per gallon
6	Reagent Injection	per week	15	$7,500	$112,500	3,000 gallons per day
7	Installation of new asphalt pavement	sq. yd.	10,889	$25	$272,222	Marina Parking Lot Area
8	Installation of low permeability cap	cy	4,722	$25	$118,056	3 ft. of clay over former coal tar dump area
9	Top Soil	sq. yd.	4,722	$18	$85,000	0.5 ft. topsoil cover over clay cap
10	Vegetation	acre	1	$3,500	$3,500	Seeding
11	Storm water Drainage System	Basin	2	$30,000	$60,000	For water runoff during storm post-remediation
				Subtotal	$1,352,389	
	Mobilization/Demobilization @	5%	of	$1,352,389	$67,619	
	Engineering @	15%	of	$1,352,389	$202,858	
	Construction Oversight @	15%	of	$1,352,389	$202,858	
				Subtotal	**$1,825,725**	
	Contingency @	20%	of	$1,352,389	$270,478	
	Total			**Total**	**$2,096,203**	

Post Construction ***Shallow Groundwater - Kreher Park***

Item No.	Item					
1	Groundwater Monitoring	year	7	$15,000	$105,000	
2	Annual report	year	7	$2,500	$17,500	
	subtotal		**Subtotal**	**$17,500**	**$122,500**	
	Present worth @7% Discount				**$94,308**	
				Total	**$2,190,510**	

GRAND TOTAL $10,048,085

In-situ chemical oxidation

Summary	In-situ chemical oxidation	Capital Costs	Mob / Demob	Engineering	Construction Oversight	Contingency	OM & M Costs	Estimated Cost
	Copper Falls Aquifer	$2,017,500	$100,875	$302,625	$302,625	$403,500	$2,596,420	$5,723,545
	Shallow Groundwater - Filled Ravine	$1,333,333	$66,667	$200,000	$200,000	$266,667	$67,363	$2,134,029
	Shallow Groundwater - Kreher Park	$1,352,389	$67,619	$202,858	$202,858	$270,478	$94,308	$2,190,510
	GRAND TOTAL	$4,703,222	$235,161	$705,483	$705,483	$940,644	$2,758,090	$10,048,085

Table F2-9
Alternate GW7: Electrical Resistance Heating

In-situ Treatment **Electrical Resistance Heating**

		Total Area:		
1	***Asphalt Pavement -***	26,000	sq ft	NSPW Property South of St. Claire Street
	Includes 6 inches stone, 3 inches binder, 2 inches surface.	22,000	sq ft	NSPW Property North of St. Claire Street
		98,000	sq ft	Marina Parking Lot Area
2	***Low Permeability Cap -***			
	Includes 3 feet of clay.	42,500	sq ft	Former Coal Tar Dump Area

Upland Area ***Copper Falls Aquifer***

Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
1	Building Demolition	Est.	1	$50,000	$50,000	Center section of NSPW building overlying filled ravine.
2	Electrodes - Copper Falls	each	200	$2,500	$500,000	
3	Electrode installation	each	200	$5,000	$1,000,000	
4	Lateral piping - electrodes	ln ft	2,000	$50	$100,000	
5	Six Phase Heating equipment	Est.	1	$500,000	$500,000	
6	Six Phase Heating construction and setup	Est.	1	$500,000	$500,000	
7	Temp. Monitoring Points	each	24	$1,000	$24,000	
8	Electrical costs	month	12	$50,000	$600,000	
9	Extraction wells	each	12	$7,500	$90,000	
10	Extraction well pumps	per gal	12	$3,500	$42,000	
11	Lateral piping - extraction wells	ln ft	1,500	$75	$112,500	
12	UST/OWS System	Est.	1	$15,000	$15,000	Upgrade existing system
13	Wastewater treatment equipment	Est.	1	$25,000	$25,000	Upgrade existing system
14	Vapor phase treatment equipment & GAC	Est.	1	$25,000	$25,000	Upgrade existing system
15	Operation and Maintenance	month	12	$4,800	$57,600	Existing groundwater extraction system
16	Waste-water treatment & disposal	gallons	10,512,000	$0.05	$525,600	20 gpm @ $0.05
17	Probe/well abandonment	Est.	1	$272,500	$272,500	25-percent of installation cost
				Subtotal	**$4,439,200**	
	Mobilization/Demobilization @	5%	of	$4,439,200	$221,960	
	Engineering @	15%	of	$4,439,200	$665,880	
	Construction Oversight @	15%	of	$4,439,200	$665,880	
				Subtotal	**$5,992,920**	
	Contingency @	20%	of	$4,439,200	$887,840	
				Total	**$6,880,760**	

Post Construction ***Copper Falls Aquifer***

Item No.	Item	Unit	Quantity	Unit Cost	Total
1	Groundwater Monitoring	year	5	$25,000	$125,000
2	Annual report	year	5	$5,000	$25,000
			Subtotal	$30,000	$150,000
	Present worth @7% Discount				**$123,000**
				Total	**$7,003,760**

Table F2-9
Alternate GW7: Electrical Resistance Heating

Upland Area ***Shallow Groundwater - Filled Ravine***

Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
1	Building Demolition	Est.	1	$50,000	$50,000	Center section of NSPW building overlying filled ravine.
2	Electrodes - filled ravine	each	200	$2,000	$400,000	
3	Electrode installation	each	200	$2,500	$500,000	
4	Lateral piping - electrodes	ln ft	2,000	$50	$100,000	
5	Six Phase Heating equipment	Est.	1	$500,000	$500,000	
6	Six Phase Heating construction and setup	Est.	1	$500,000	$500,000	
7	Temp. Monitoring Points	each	24	$1,000	$24,000	
8	Electrical costs	month	12	$15,000	$180,000	
9	Groundwater extraction well	each	4	$2,500	$10,000	
10	Vent wells	each	10	$1,500	$15,000	
11	Vapor phase treatment equipment & GAC	Est.	1	$25,000	$25,000	Upgrade existing system
12	Storage tanks & transfer pumps and piping	Est.	1	$25,000	$25,000	
13	Waste-water treatment & disposal	gallons	5,256,000	$0.05	$262,800	10 gpm @ $0.05 for 12 months (existing treatment system)
14	Probe/well abandonment	Est.	1	$127,500	$127,500	25-percent of installation cost
15	Installation of new asphalt pavement	sq. yd.	2,889	$25	$72,222	NSPW Property South of St. Claire Street (includes grading)
16	Installation of new asphalt pavement	sq. yd.	2,444	$25	$61,111	NSPW Property North of St. Claire Street (includes grading)
				Subtotal	**$2,852,633**	
	Mobilization/Demobilization @	5%	of	$2,852,633	$142,632	
	Engineering @	15%	of	$2,852,633	$427,895	
	Construction Oversight @	15%	of	$2,852,633	$427,895	
				Subtotal	**$3,851,055**	
	Contingency @	20%	of	$2,852,633	$570,527	
				Total	**$4,421,582**	

Post Construction ***Shallow Groundwater - Filled Ravine***

Item No.	Item	Unit	Quantity	Unit Cost	Total
1	Groundwater Monitoring	year	5	$10,000	$50,000
2	Annual report	year	5	$2,500	$12,500
			Subtotal	$12,500	$62,500
	Present worth @7% Discount				**$51,250**
				Total	**$4,472,832**

Table F2-9
Alternate GW7: Electrical Resistance Heating

Kreher Park ***Shallow Groundwater - Kreher Park***

Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
1	Clear and Grub	Est.	1	$10,000	$10,000	
2	Electrodes - former seep / coal tar dump and TW-11areas	each	150	$2,000	$300,000	
3	Electrode installation	each	150	$2,500	$375,000	
4	Lateral piping - electrodes	ln ft	2,000	$50	$100,000	
5	Six Phase Heating equipment	Est.	0	$500,000	$0	Will utilize same equipment for filled ravine
6	Six Phase Heating construction and setup	Est.	1	$500,000	$500,000	
7	Temp. Monitoring Points	each	24	$1,000	$24,000	
8	Electrical costs	month	12	$15,000	$180,000	Will utilize same equipment for filled ravine
9	Groundwater extraction well	each	4	$2,500	$10,000	
10	Vent wells	each	10	$1,500	$15,000	
11	Vapor phase treatment equipment & GAC	Est.	1	$25,000	$25,000	
12	Storage tanks & transfer pumps and piping	Est.	1	$250,000	$250,000	
13	Waste-water treatment & disposal	gallons	10,512,000	$0.05	$525,600	20 gpm @ $0.05 for 12 months (existing treatment system)
14	Probe/well abandonment	Est.	1	$96,250	$96,250	25-percent of installation cost
15	Installation of new asphalt pavement	sq. yd.	10,889	$25	$272,222	Marina Parking Lot Area
16	Installation of low permeability cap	cy	4,722	$25	$118,056	3 ft. of clay over former coal tar dump area
17	Top Soil	sq. yd.	4,722	$18	$85,000	0.5 ft. topsoil cover over clay cap
18	Vegetation	acre	1	$3,500	$3,500	Seeding
19	Storm water Drainage System	Basin	2	$30,000	$60,000	For water runoff during storm post-remediation
				Subtotal	$2,949,628	
	Mobilization/Demobilization @	5%	of	$2,949,628	$147,481	
	Engineering @	15%	of	$2,949,628	$442,444	
	Construction Oversight @	15%	of	$2,949,628	$442,444	
				Subtotal	**$3,981,998**	
	Contingency @	20%	of	$2,949,628	$589,926	
				Total	**$4,571,923**	

Post Construction ***Shallow Groundwater - Kreher Park***

Item No.	Item	Unit	Quantity	Unit Cost	Total
1	Groundwater Monitoring	year	5	$15,000	$75,000
2	Annual report	year	5	$2,500	$12,500
			Subtotal	$17,500	$87,500
	Present worth @7% Discount				**$71,750**
				Total	**$4,643,673**

GRAND TOTAL $16,120,265

Summary	Electrical Resistance Heating	Capital Costs	Mob / Demob	Engineering	Construction Oversight	Contingency	OM & M Costs	Estimated Cost
	Copper Falls Aquifer	$4,439,200	$221,960	$665,880	$665,880	$887,840	$123,000	$7,003,760
	Shallow Groundwater - Filled Ravine	$2,852,633	$142,632	$427,895	$427,895	$570,527	$51,250	$4,472,832
	Shallow Groundwater - Filled Ravine	$2,949,628	$147,481	$442,444	$442,444	$589,926	$71,750	$4,643,673
	GRAND TOTAL	**$10,241,461**	**$512,073**	**$1,536,219**	**$1,536,219**	**$2,048,292**	**$246,000**	**$16,120,265**

Table F2-10
Alternate GW8: Steam Injection (Dynamic Underground Stripping and Contained Recovery of Oily Waters)

In-situ Treatment **Steam Injection (Dynamic Underground Stripping and Contained Recovery of Oily Waters)**

		Total Area:		
1	***Asphalt Pavement -***	26,000	sq ft	NSPW Property South of St. Claire Street
	Includes 6 inches stone, 3 inches binder, 2 inches surface.	22,000	sq ft	NSPW Property North of St. Claire Street
2	***Low Permeability Cap -***			
	Includes 3 feet of clay.	42,500	sq ft	Former Coal Tar Dump Area

Upland Area ***Copper Falls Aquifer (DUS)***

Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
1	Steam injection well	each	12	$25,000	$300,000	
2	Steam extraction well	per gal	9	$20,000	$180,000	
3	Lateral piping	ln ft	1,000	$250	$250,000	
4	Temp. Monitoring Points	each	12	$2,500	$30,000	
5	Steam Injection System	Est.	1	$350,000	$250,000	
6	Steam generation cost	month	6	$150,000	$900,000	
7	Electrodes - Copper Falls	each	50	$2,500	$125,000	
8	Electrode installation	each	50	$5,000	$250,000	
9	Lateral piping - electrodes	ln ft	10,000	$75	$750,000	
10	Six Phase Heating equipment	Est.	1	$250,000	$250,000	
11	Six Phase Heating construction and setup	Est.	1	$250,000	$250,000	
12	Electrical costs	month	6	$50,000	$300,000	
13	UST/OWS System	Est.	1	$15,000	$15,000	Upgrade existing system
14	Wastewater treatment equipment	Est.	1	$25,000	$25,000	Upgrade existing system
15	Vapor phase treatment equipment & GAC	Est.	1	$25,000	$25,000	Upgrade existing system
16	Operation and Maintenance	month	6	$4,800	$28,800	Existing groundwater extraction system
17	Waste-water treatment & disposal	gallons	5,184,000	$0.10	$518,400	20 gpm @ $0.10
17	Probe/well abandonment	Est.	1	$190,000	$190,000	25-percent of installation cost
				Subtotal	**$4,637,200**	
	Mobilization/Demobilization @	5%	of	$4,637,200	$231,860	
	Engineering @	15%	of	$4,637,200	$695,580	
	Construction Oversight @	15%	of	$4,637,200	$695,580	
				Subtotal	**$6,260,220**	
	Contingency @	20%	of	$4,637,200	$927,440	
				Total	**$7,187,660**	

Post Construction ***Copper Falls Aquifer***

Item No.	Item	Unit	Quantity	Unit Cost	Total
1	Groundwater Monitoring	year	5	$25,000	$125,000
2	Annual report	year	5	$5,000	$25,000
			Subtotal	$30,000	$150,000
	Present worth @7% Discount				**$123,000**
				Total	**$7,310,660**

Table F2-10
Alternate GW8: Steam Injection (Dynamic Underground Stripping and Contained Recovery of Oily Waters)

Upland Area ***Shallow Groundwater - Filled Ravine (CROW)***

Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
1	Building Demolition	Est.	1	$50,000	$50,000	Center section of NSPW building overlying filled ravine.
2	Steam injection well	each	10	$25,000	$250,000	
3	Steam extraction well	per gal	5	$20,000	$100,000	
4	Lateral piping	ln ft	1,000	$250	$250,000	
5	Temp. Monitoring Points	each	12	$1,000	$12,000	
6	Steam Injection System	Est.	1	$250,000	$250,000	
7	Steam generation cost	month	6	$50,000	$300,000	
8	UST/OWS System	Est.	1	$15,000	$15,000	Upgrade existing system
9	Wastewater treatment equipment	Est.	1	$25,000	$25,000	Upgrade existing system
10	Vapor phase treatment equipment & GAC	Est.	1	$25,000	$25,000	Upgrade existing system
11	Operation and Maintenance	month	6	$4,800	$28,800	Existing groundwater extraction system
12	Waste-water treatment & disposal	gallons	$2,592,000	$0.10	$259,200	10 gpm @ $0.2
13	Installation of new asphalt pavement	sq. yd.	2,889	$25	$72,222	NSPW Property South of St. Claire Street (includes grading)
14	Installation of new asphalt pavement	sq. yd.	2,444	$25	$61,111	NSPW Property North of St. Claire Street (includes grading)
				Subtotal	**$1,698,333**	
	Mobilization/Demobilization @	5%	of	$1,698,333	$84,917	
	Engineering @	15%	of	$1,698,333	$254,750	
	Construction Oversight @	15%	of	$1,698,333	$254,750	
				Subtotal	**$2,292,750**	
	Contingency @	20%	of	$1,698,333	$339,667	
				Total	**$2,632,417**	

Post Construction ***Shallow Groundwater - Filled Ravine***

Item No.	Item	Unit	Quantity	Unit Cost	Total
1	Groundwater Monitoring	year	5	$10,000	$50,000
2	Annual report	year	5	$2,500	$12,500
			Subtotal	$12,500	$62,500
	Present worth @7% Discount				**$51,250**
				Total	**$2,683,667**

Table F2-10
Alternate GW8: Steam Injection (Dynamic Underground Stripping and Contained Recovery of Oily Waters)

Upland Area ***Shallow Groundwater - Kreher Park (CROW)***

Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
1	Steam injection well	each	9	$25,000	$225,000	
2	Steam extraction well	per gal	4	$20,000	$80,000	
3	Lateral piping	ln ft	1,000	$250	$250,000	
4	Temp. Monitoring Points	each	12	$1,000	$12,000	
5	Steam Injection System	Est.	1	$250,000	$250,000	
6	Steam generation cost	month	6	$50,000	$300,000	
7	Storage tanks, transfer pumps and piping	Est.	1	$15,000	$15,000	Upgrade existing system
8	Wastewater treatment equipment	Est.	1	$25,000	$25,000	Upgrade existing system
9	Vapor phase treatment equipment & GAC	Est.	1	$25,000	$25,000	Upgrade existing system
10	Operation and Maintenance	month	6	$4,800	$28,800	Existing groundwater extraction system
11	Waste-water treatment & disposal	gallons	$2,592,000	$0.10	$259,200	10 gpm @ $0.20
12	Installation of new asphalt pavement	sq. yd.	1,667	$25	$41,667	NSPW Property South of St. Claire Street (includes grading)
13	Installation of new asphalt pavement	sq. yd.	2,778	$25	$69,444	NSPW Property North of St. Claire Street (includes grading)
	subtotal			**Subtotal**	**$1,581,111**	
	Mobilization/Demobilization @	5%	of	$1,581,111	$79,056	
	Engineering @	15%	of	$1,581,111	$237,167	
	Construction Oversight @	15%	of	$1,581,111	$237,167	
				Subtotal	**$2,134,500**	
	Contingency @	20%	of	$1,581,111	$316,222	
				Total	**$2,450,722**	

Post Construction ***Shallow Groundwater - Kreher Park***

Item No.	Item	Unit	Quantity	Unit Cost	Total
1	Groundwater Monitoring	year	5	$15,000	$75,000
2	Annual report	year	5	$2,500	$12,500
			Subtotal	**$17,500**	**$87,500**
	Present worth @7% Discount				**$71,750**
				Total	**$2,522,472**

GRAND TOTAL $12,516,799

Summary	Steam Injection (DUS or CROW)	Capital Costs	Mob / Demob	Engineering	Construction Oversight	Contingency	OM & M Costs	Estimated Cost
	Copper Falls Aquifer	$4,637,200	$231,860	$695,580	$695,580	$927,440	$123,000	$7,310,660
	Shallow Groundwater - Filled Ravine	$1,698,333	$84,917	$254,750	$254,750	$339,667	$51,250	$2,683,667
	Shallow Groundwater - Kreher Park	$1,581,111	$79,056	$237,167	$237,167	$316,222	$71,750	$2,522,472
	GRAND TOTAL	**$7,916,644**	**$395,832**	**$1,187,497**	**$1,187,497**	**$1,583,329**	**$246,000**	**$12,516,799**

Table F2-11
Alternate GW9A: Existing Groundwater Extraction (Continued Operation)

Removal **Groundwater Extraction and On-site Treatment**

		Total Area:		
1	***Asphalt Pavement -***	16,000	sq ft	NSPW Property South of St. Claire Street
	Includes 6 inches stone, 3 inches binder, 2 inches surface.	22,000	sq ft	NSPW Property North of St. Claire Street

Upland Area ***Shallow Groundwater - Filled Ravine***

Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
1	Installation of new asphalt pavement	sq. yd.	1,778	$25	$44,444	NSPW Property South of St. Claire Street (includes grading)
2	Installation of new asphalt pavement	sq. yd.	2,444	$25	$61,111	NSPW Property North of St. Claire Street (includes grading)
				Subtotal	**$105,556**	
	Mobilization/Demobilization @	5%	of	$105,556	$5,278	
	Engineering @	15%	of	$105,556	$15,833	
	Construction Oversight @	15%	of	$105,556	$15,833	
				Subtotal	**$142,500**	
	Contingency @	20%	of	$105,556	$21,111	
				Total	**$163,611**	

Post Construction ***Copper Falls Aquifer/Filled Ravine***

Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
1	Operation and Maintenance	year	30	$57,600	$1,728,000	Existing groundwater extraction system
2	Groundwater extraction (existing wells)	year	30	$78,840	$2,365,200	3 gpm @ $0.05
3	Groundwater Monitoring	year	30	$35,000	$1,050,000	
4	Annual cap inspection and reporting	year	30	$7,500	$225,000	
			Subtotal	**$178,940**	**$5,368,200**	
	Present worth @7% Discount				**$2,220,466**	

GRAND TOTAL $2,384,078

Summary

	Capital Costs	Mob / Demob	Engineering	Construction Oversight	Contingency	OM & M Costs	Estimated Cost
Shallow Groundwater - Filled Ravine	$105,556	$5,278	$15,833	$15,833	$21,111	$0	$163,611
Copper Falls Aquifer/Filled Ravine	$0	$0	$0	$0	$0	$2,220,466	$2,220,466
GRAND TOTAL	**$105,556**	**$5,278**	**$15,833**	**$15,833**	**$21,111**	**$2,220,466**	**$2,384,078**

Table F2-12
Alternate GW9B: Enhanced Groundwater Extraction

Removal **Groundwater Extraction and On-site Treatment**

		Total Area:		
1	***Asphalt Pavement -***	16,000	sq ft	NSPW Property South of St. Claire Street
	Includes 6 inches stone, 3 inches binder, 2 inches surface.	22,000	sq ft	NSPW Property North of St. Claire Street
		98,000	sq ft	Marina Parking Lot Area
2	***Low Permeability Cap -***			
	Includes 3 feet of clay.	42,500	sq ft	Former Coal Tar Dump Area

Upland Area ***Copper Falls Aquifer***

Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
1	Extraction wells	each	12	$7,500	$90,000	
2	Pumps	per gal	12	$3,500	$42,000	
3	Lateral piping	ln ft	1,500	$75	$112,500	
4	UST/OWS System	Est.	1	$15,000	$15,000	Upgrade existing system
5	Wastewater treatment equipment	Est.	1	$25,000	$25,000	Upgrade existing system
				Subtotal	**$284,500**	
	Mobilization/Demobilization @	5%	of	$284,500	$14,225	
	Engineering @	15%	of	$284,500	$42,675	
	Construction Oversight @	15%	of	$284,500	$42,675	
				Subtotal	**$384,075**	
	Contingency @	20%	of	$284,500	$56,900	
				Total	**$440,975**	

Post Construction ***Copper Falls Aquifer***

Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
1	Operation and Maintenance	year	30	$57,600	$1,728,000	Existing groundwater extraction system
2	Groundwater extraction (existing wells)	year	30	$394,200	$11,826,000	15 gpm @ $0.05
3	Groundwater Monitoring	year	30	$25,000	$750,000	
4	Annual cap inspection and reporting	year	30	$5,000	$150,000	
			Subtotal	**$481,800**	**$14,454,000**	
	Present worth @7% Discount				**$5,978,656**	

Table F2-12
Alternate GW9B: Enhanced Groundwater Extraction

					Total	**$6,419,631**	
Upland Area	***Shallow Groundwater - Filled Ravine***						
Item No.	**Item**	**Unit**	**Quantity**	**Unit Cost**	**Total**		**Notes**
1	Installation of new asphalt pavement	sq. yd.	1,778	$25		$44,444	NSPW Property South of St. Claire Street (includes grading)
2	Installation of new asphalt pavement	sq. yd.	2,444	$25		$61,111	NSPW Property North of St. Claire Street (includes grading)
				Subtotal		**$105,556**	
	Mobilization/Demobilization @	5%	of	$105,556		$5,278	
	Engineering @	15%	of	$105,556		$15,833	
	Construction Oversight @	15%	of	$105,556		$15,833	
				Subtotal		**$142,500**	
	Contingency @	20%	of	$105,556		$21,111	
				Total		**$163,611**	

Kreher Park	***Shallow Groundwater***					
Item No.	**Item**	**Unit**	**Quantity**	**Unit Cost**	**Total**	**Notes**
1	Extraction trench	ln ft	1,500	$150	$225,000	
2	Sump and pump	each	1	$20,000	$20,000	
3	Lateral piping	ln ft	1,500	$75	$112,500	
4	Treatment equipment	each	1	$30,000	$30,000	
5	Building	each	1	$25,000	$25,000	
6	UST/OWS System	Est.	1	$15,000	$15,000	
7	Installation of new asphalt pavement	sq. yd.	10,889	$25	$272,222	Marina parking lot
8	Installation of low permeability cap	cy	4,722	$25	$118,056	3 ft. of clay over former coal tar dump area
9	Top Soil	sq. yd.	4,722	$18	$85,000	0.5 ft. topsoil cover over clay cap
10	Vegetation	acre	1	$3,500	$3,500	Seeding
11	Storm water Drainage System	Basin	2	$30,000	$60,000	For water runoff during storm post-remediation
				Subtotal	**$966,278**	
	Mobilization/Demobilization @	5%	of	$966,278	$48,314	
	Engineering @	15%	of	$966,278	$144,942	
	Construction Oversight @	15%	of	$966,278	$144,942	
				Subtotal	**$1,304,475**	
	Contingency @	20%	of	$966,278	$193,256	
				Total	**$1,497,731**	

Table F2-12
Alternate GW9B: Enhanced Groundwater Extraction

Post Construction ***Shallow Groundwater***

Item No.	Item	Unit	Quantity	Unit Cost	Total	Notes
1	Operation and Maintenance	year	30	$57,600	$1,728,000	
2	Waste-water treatment & disposal	year	30	$1,314,000	$39,420,000	50 gpm @ $0.05
3	Groundwater Monitoring	year	30	$25,000	$750,000	
4	Annual cap inspection and reporting	year	30	$5,000	$150,000	
	subtotal			$1,401,600	$42,048,000	
	Present worth @7% Discount				**$17,392,454**	
				Subtotal	**$18,890,185**	

GRAND TOTAL $25,415,372

Summary	Capital Costs	Mob / Demob	Engineering	Construction Oversight	Contingency	OM & M Costs	Estimated Cost
Copper Falls Aquifer	$284,500	$14,225	$42,675	$42,675	$56,900	$5,978,656	$6,419,631
Shallow Groundwater - Filled Ravine	$105,556	$5,278	$15,833	$15,833	$21,111	$0	$163,611
Shallow Groundwater - Kreher Park	$966,278	$48,314	$144,942	$144,942	$193,256	$17,392,454	$18,890,185
GRAND TOTAL	$1,356,333	$67,817	$203,450	$203,450	$271,267	$23,371,111	$25,473,427